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Patent  
Attorney Docket No. 81350PROPCT/US

TRANSMITTAL LETTER

Inventor: Kuolih Tsai et al.  
Serial No: 10/031,144  
Int'l. Appln. Filing Date: June 28, 2000  
Notice of Allowance:  
For: HEAT-TRANSFER LABEL INCLUDING NON-WAX RELEASE COATING

Examiner: Unknown  
Group Art Unit: Unknown  
Batch No:

Box PCT  
Commissioner for Patents  
Washington, D. C. 20231

Dear Sir:

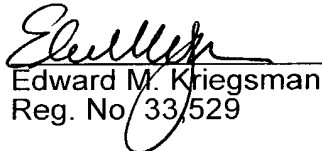
Transmitted herewith for the above-identified patent application are the following:

A copy of Notification of Missing Requirements dated March 22, 2002  
A Declaration  
A check for \$240 (\$110 ext of time; \$130 late-filing Declaration surcharge)  
A return postcard

The item(s) checked below are appropriate:

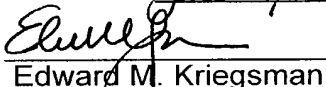
1. ☒ Applicant(s) hereby petition(s) for a one (1) month extension of time to respond to an Office Action dated March 22, 2002.
2. ☒ Please charge any fees or costs not accounted for to Deposit Account No. 11-1755.

Date: June 24, 2002

  
Edward M. Kriegsman  
Reg. No 33,529

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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Box PCT, Commissioner for Patents, Washington, DC 20231 on June 24, 2002.

  
Edward M. Kriegsman

Adjustment date: 07/30/2002 AJOHNS02

07/05/2002 LLANDGRA 00000113 10031144

02 FC:115 110.00 OP

Repln. Ref: 07/30/2002 AJOHNS02 0012052200

DAN:111755 Name/Number:10031144

FC: 704 \$110.00 CR

07/05/2002 LLANDGRA 00000113 10031144

01 FC:154 130.00 OP  
02 FC:115 110.00 OP

07/30/2002 AJOHNS02 00000007 111755 10031144

01 FC:116 400.00 CH

Practitioner's Docket No. 81350PROPCTUS

**CHAPTER II**

Preliminary Classification:

Proposed Class:

Subclass:

NOTE: "All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.'" M.P.E.P., § 601, 7th ed.

**TRANSMITTAL LETTER  
TO THE UNITED STATES ELECTED OFFICE (EO/US)**

**(ENTRY INTO U.S. NATIONAL PHASE UNDER CHAPTER II)**

PCT/US00/17703	28 June 2000	08 July 1999
INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
HEAT-TRANSFER LABEL INCLUDING NON-WAX RELEASE COATING		
TITLE OF INVENTION		
KUOLIH TSAI, JOHN W. GEURTSSEN AND JAMES S. NUGENT		
APPLICANT(S)		

**Box PCT**  
**Assistant Commissioner for Patents**  
**Washington D.C. 20231**  
**ATTENTION: EO/US**

**CERTIFICATION UNDER 37 C.F.R. § 1.10\***  
(Express Mail label number is mandatory.)  
(Express Mail certification is optional.)

I hereby certify that this Transmittal Letter and the papers indicated as being transmitted therewith is being deposited with the United States Postal Service on this date January 7, 2002 in an envelope as "Express Mail Post Office to Addressee" Mailing Label Number EL919995516US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

EDWARD M. KRIEGSMAN

(type or print name of person mailing paper)



Signature of person mailing paper

**WARNING:** Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. § 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.

**\*WARNING:** Each paper or fee filed by "Express Mail" must have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. § 1.10(b).  
"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.

(Transmittal Letter to the United States Elected Office (EO/US) [13-18]—page 1 of 8)

**NOTE:** To avoid abandonment of the application, the applicant shall furnish to the USPTO, not later than 20 months from the priority date: (1) a copy of the international application, unless it has been previously communicated by the International Bureau or unless it was originally filed in the USPTO; and (2) the basic national fee (see 37 C.F.R. § 1.492(a)). The 30-month time limit may not be extended. 37 C.F.R. § 1.495.

**WARNING:** Where the items are those which can be submitted to complete the entry of the international application into the national phase are subsequent to 30 months from the priority date the application is still considered to be in the international state and if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. § 1.10 must be used (since international application papers are not covered by an ordinary certificate of mailing—See 37 C.F.R. § 1.8.

**NOTE:** Documents and fees must be clearly identified as a submission to enter the national state under 35 U.S.C. § 371 otherwise the submission will be considered as being made under 35 U.S.C. § 111. 37 C.F.R. § 1.494(f).

**I. Applicant herewith submits to the United States Elected Office (EO/US) the following items under 35 U.S.C. § 371:**

- a. ☒ This express request to immediately begin national examination procedures (35 U.S.C. § 371(f)).
- b. ☒ The U.S. National Fee (35 U.S.C. § 371(c)(1)) and other fees (37 C.F.R. § 1.492) as indicated below:

2. Fees

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
<input type="checkbox"/>	TOTAL CLAIMS	79 -20=	59	x \$18.00=	\$ 1062
	INDEPENDENT CLAIMS	6 -3=	3	x \$84.00 x <del>\$70.00</del>	252
	MULTIPLE DEPENDENT CLAIM(S) (if applicable) + \$280.00 <del>\$260.00</del>				0
BASIC FEE**	<input checked="" type="checkbox"/> U.S. PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where an international preliminary examination fee as set forth in § 1.482 has been paid on the international application to the U.S. PTO: <input checked="" type="checkbox"/> and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(1) to (4) have been satisfied for all the claims presented in the application entering the national stage (37 C.F.R. § 1.492(a)(4)) ..... \$100.00 <input type="checkbox"/> and the above requirements are not met (37 C.F.R. § 1.492(a)(1)) ..... \$670.00 <input type="checkbox"/> U.S. PTO WAS NOT INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where no international preliminary examination fee as set forth in § 1.482 has been paid to the U.S. PTO, and payment of an international search fee as set forth in § 1.445(a)(2) to the U.S. PTO: <input type="checkbox"/> has been paid (37 C.F.R. § 1.492(a)(2)) ..... \$690.00 <input type="checkbox"/> has not been paid (37 C.F.R. § 1.492(a)(3)) ..... \$970.00 <input type="checkbox"/> where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 C.F.R. § 1.492(a)(5)) ..... \$840.00				\$100
	Total of above Calculations				= \$1414
SMALL ENTITY	Reduction by 1/2 for filing by small entity, if applicable. Affidavit must be filed also. (note 37 C.F.R. § 1.9, 1.27, 1.28)				- 0
	Subtotal				0
	Total National Fee				\$1414
	Fee for recording the enclosed assignment document \$40.00 (37 C.F.R. § 1.21(h)). (See Item 13 below). See attached "ASSIGNMENT COVER SHEET".				0
TOTAL	Total Fees enclosed				\$1414

\*See attached Preliminary Amendment Reducing the Number of Claims.

- i. ☒ A check in the amount of \$ 1414 to cover the above fees is enclosed.
- ii. ☐ Please charge Account No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_.  
A duplicate copy of this sheet is enclosed.

**\*\*WARNING:** "To avoid abandonment of the application the applicant shall furnish to the United States Patent and Trademark Office not later than the expiration of 30 months from the priority date: \* \* \* (2) the basic national fee (see § 1.492(a)). The 30-month time limit may not be extended." 37 C.F.R. § 1.495(b).

**WARNING:** If the translation of the international application and/or the oath or declaration have not been submitted by the applicant within thirty (30) months from the priority date, such requirements may be met within a time period set by the Office. 37 C.F.R. § 1.495(b)(2). The payment of the surcharge set forth in § 1.492(e) is required as a condition for accepting the oath or declaration later than thirty (30) months after the priority date. The payment of the processing fee set forth in § 1.492(f) is required for acceptance of an English translation later than thirty (30) months after the priority date. Failure to comply with these requirements will result in abandonment of the application. The provisions of § 1.136 apply to the period which is set. Notice of Jan. 3, 1993, 1147 O.G. 29 to 40.

3. ☒ A copy of the International application as filed (35 U.S.C. § 371(c)(2)):

**NOTE:** Section 1.495 (b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 30 months from the priority date to avoid abandonment. "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage, the applicant normally need only check to be sure the notice from the International Bureau has been received and then pay the basic national fee by 30 months from the priority date." Notice of Jan. 7, 1993, 1147 O.G. 29 to 40, at 35-36. See item 14c below.

- a. ☐ is transmitted herewith.
- b. ☒ is not required, as the application was filed with the United States Receiving Office.
- c. ☐ has been transmitted
  - i. ☐ by the International Bureau.  
Date of mailing of the application (from form PCT/1B/308): \_\_\_\_\_
  - ii. ☐ by applicant on \_\_\_\_\_  
Date

4. ☒ A translation of the International application into the English language (35 U.S.C. § 371(c)(2)):

- a. ☐ is transmitted herewith.
- b. ☒ is not required as the application was filed in English.
- c. ☐ was previously transmitted by applicant on \_\_\_\_\_  
Date
- d. ☐ will follow.

5. ☒ Amendments to the claims of the International application under PCT Article 19 (35 U.S.C. § 371(c)(3)):

NOTE: The Notice of January 7, 1993 points out that 37 C.F.R. § 1.495(a) was amended to clarify the existing and continuing practice that PCT Article 19 amendments must be submitted by 30 months from the priority date and this deadline may not be extended. The Notice further advises that: "The failure to do so will not result in loss of the subject matter of the PCT Article 19 amendments. Applicant may submit that subject matter in a preliminary amendment filed under section 1.121. In many cases, filing an amendment under section 1.121 is preferable since grammatical or idiomatic errors may be corrected." 1147 O.G. 29-40, at 36.

- a. ☐ are transmitted herewith.
- b. ☐ have been transmitted
  - i. ☐ by the International Bureau.  
Date of mailing of the amendment (from form PCT/1B/308): \_\_\_\_\_
  - ii. ☐ by applicant on (date) \_\_\_\_\_  
Date
- c. ☒ have not been transmitted as
  - i. ☒ applicant chose not to make amendments under PCT Article 19.  
Date of mailing of Search Report (from form PCT/ISA/210.): 24 August 2000
  - ii. ☐ the time limit for the submission of amendments has not yet expired.  
The amendments or a statement that amendments have not been made will be transmitted before the expiration of the time limit under PCT Rule 46.1.

6. ☒ A translation of the amendments to the claims under PCT Article 19 (38 U.S.C. § 371(c)(3)):

- a. ☐ is transmitted herewith.
- b. ☐ is not required as the amendments were made in the English language.
- c. ☒ has not been transmitted for reasons indicated at point 5(c) above.

7. ☒ A copy of the international examination report (PCT/IPEA/409)

- ☒ is transmitted herewith.
- ☐ is not required as the application was filed with the United States Receiving Office.

8. ☒ Annex(es) to the international preliminary examination report

- a. ☐ is/are transmitted herewith.
- b. ☒ is/are not required as the application was filed with the United States Receiving Office.

9. ☐ A translation of the annexes to the international preliminary examination report

- a. ☐ is transmitted herewith.
- b. ☐ is not required as the annexes are in the English language.

10. ☒ An oath or declaration of the inventor (35 U.S.C. § 371(c)(4)) complying with 35 U.S.C. § 115
- a. ☐ was previously submitted by applicant on \_\_\_\_\_  
 Date
- b. ☐ is submitted herewith, and such oath or declaration
- i. ☐ is attached to the application.
- ii. ☐ identifies the application and any amendments under PCT Article 19 that were transmitted as stated in points 3(b) or 3(c) and 5(b); and states that they were reviewed by the inventor as required by 37 C.F.R. § 1.70.
- c. ☒ will follow.

II. Other document(s) or information included:

11. ☒ An International Search Report (PCT/ISA/210) or Declaration under PCT Article 17(2)(a):
- a. ☒ is transmitted herewith.
- b. ☐ has been transmitted by the International Bureau.  
 Date of mailing (from form PCT/IB/308): \_\_\_\_\_
- c. ☐ is not required, as the application was searched by the United States International Searching Authority.
- d. ☐ will be transmitted promptly upon request.
- e. ☐ has been submitted by applicant on \_\_\_\_\_  
 Date
12. ☒ An Information Disclosure Statement under 37 C.F.R. §§ 1.97 and 1.98:
- a. ☒ is transmitted herewith.  
 Also transmitted herewith is/are:
- ☐ Form PTO-1449 (PTO/SB/08A and 08B).
- ☒ Copies of citations listed.
- b. ☐ will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. § 371(c).
- c. ☐ was previously submitted by applicant on \_\_\_\_\_  
 Date
13. ☐ An assignment document is transmitted herewith for recording.  
 A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

14. ☒ Additional documents:
- a. ☐ Copy of request (PCT/RO/101)
  - b. ☐ International Publication No. \_\_\_\_\_
    - i. ☐ Specification, claims and drawing
    - ii. ☐ Front page only
  - c. ☒ Preliminary amendment (37 C.F.R. § 1.121)
  - d. ☐ Other
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
15. ☒ The above checked items are being transmitted
- a. ☒ before 30 months from any claimed priority date.
  - b. ☐ after 30 months.
16. ☐ Certain requirements under 35 U.S.C. § 371 were previously submitted by the applicant on \_\_\_\_\_, namely:
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

#### AUTHORIZATION TO CHARGE ADDITIONAL FEES

**WARNING:** Accurately count claims, especially multiple dependant claims, to avoid unexpected high charges if extra claims are authorized.

**NOTE:** "A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

**NOTE:** "Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

☒ The Commissioner is hereby authorized to charge the following additional fees that may be required by this paper and during the entire pendency of this application to Account No. 11-1755

☒ 37 C.F.R. § 1.492(a)(1), (2), (3), and (4) (filing fees)

**WARNING:** Because failure to pay the national fee within 30 months without extension (37 C.F.R. § 1.495(b)(2)) results in abandonment of the application, it would be best to always check the above box.

(Transmittal Letter to the United States Elected Office (EO/US) [13-18]—page 7 of 8)



☐ 37 C.F.R. § 1.492(b), (c) and (d) (presentation of extra claims)

**NOTE:** Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.492(d)), it might be best not to authorize the PTO to charge additional claim fees, except possible when dealing with amendments after final action.

☐ 37 C.F.R. § 1.17 (application processing fees)

☐ 37 C.F.R. § 1.17(a)(1)-(5) (extension fees pursuant to § 1.136(a).

☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

**NOTE:** Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

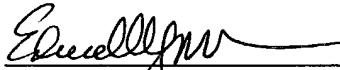
**NOTE:** 37 C.F.R. § 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying . . . issue fee." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

☐ 37 C.F.R. § 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 30 months after the priority date).

Reg. No.: 33,529

Tel. No.: ( 508) 879-3500

Customer No.: 23685



SIGNATURE OF PRACTITIONER

EDWARD M. KRIEGSMAN

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**HEAT-TRANSFER LABEL INCLUDING**  
**NON-WAX RELEASE COATING**  
**BACKGROUND OF THE INVENTION**

The present invention relates generally to heat-transfer labels and more particularly to heat-transfer labels that include a non-wax release layer or a non-wax release coating.

Heat-transfer labels are commonly used in the decorating and/or labelling of commercial articles, such as, and without limitation to, containers for beverages (including alcoholic beverages, such as beer), essential oils, detergents, adverse chemicals, as well as health and beauty aids. As can readily be appreciated, heat-transfer labels are desirably resistant to abrasion and chemical effects in order to avoid a loss of label information and desirably possess good adhesion to the articles to which they are affixed.

One of the earliest types of heat-transfer label is described in U.S. Patent No. 3,616,015, inventor Kingston, which issued October, 1971, and which is incorporated herein by reference. In the aforementioned patent, there is disclosed a heat-transfer label comprising a paper sheet or web, a wax release layer affixed to the paper sheet, and an ink design layer printed on the wax release layer. In the heat-transfer labelling process, the label-carrying web is subjected to heat, and the label is pressed onto an article with the ink design layer making direct contact with the article. As the paper sheet is subjected to heat, the wax layer begins to melt. This enables the paper sheet to be released from the ink design layer, with a portion of the wax layer being transferred with the ink design layer onto the article and with a portion of the wax layer remaining with the paper sheet. After transfer of the design to the article, the paper sheet is immediately removed, leaving the design firmly affixed to the article and the wax transferred therewith exposed to the environment. The wax layer is thus intended to serve two purposes: (1) to provide release of the ink design from the web upon application of heat to the web and (2) to form a protective layer over the transferred ink design. After transfer of the label to the article, the transferred wax release layer is typically subjected to a post-flaming technique which enhances the

optical clarity of the wax protective layer (thereby enabling the ink design layer therebeneath to be better observed) and which enhances the protective properties of the transferred wax release.

Many heat-transfer labels include, in addition to the layers described above,  
5 an adhesive layer (comprising, for example, a polyamide or polyester adhesive) deposited over the ink design to facilitate adhesion of the label onto a receiving article. An example of a heat-transfer label having an adhesive layer is disclosed in U.S. Patent No. 4,548,857, inventor Galante, which issued October 22, 1985, and which is incorporated herein by reference. Additionally, many heat-transfer labels  
10 additionally include a protective lacquer layer interposed between the wax release layer and the ink layer. An example of such a label is disclosed in U.S. Patent No. 4,426,422, inventor Daniels, which issued January 17, 1984, and which is incorporated herein by reference.

One phenomenon that has been noted with heat-transfer labels of the type  
15 described above containing a wax release layer is that, quite often, a degree of hazing or a "halo" is noticeable over the transferred label when the transfer is made onto clear materials. This "halo" effect, which persists despite post-flaming and which may detract from the appearance of the label, is caused by the presence of the wax coating around the outer borders of the transferred ink design layer. Hazing due to  
20 the wax release layer may also appear in "open-copy" areas of the label, i.e., areas of the label where no ink is present between the adhesive and protective lacquer layers, and also may detract from the appearance of the label.

In addition to and related to the aforementioned problem of hazing, when heat-transfer labels of the type described above are applied to dark-colored containers, the  
25 outer wax layer of the label often appears as a whitish coating on the container, which effect is undesirable in many instances. Furthermore, scratches and similar abrasions to the outer wax layer of the label can occur easily and are readily detectable.

Accordingly, to address the aforementioned issues, considerable effort has  
30 been expended in replacing or obviating the need for a wax release layer. One such

approach to this problem is disclosed in U.S. Patent No. 3,922,435, inventor Asnes, which issued November 25, 1975, and which is incorporated herein by reference. In the aforementioned Asnes patent, which relates to a heat-transfer label for objects such as plastic bottles, the customary release layer of wax is replaced with a release  
5 layer of a non-wax resin. This non-wax resinous layer is referred to in the Asnes patent as a dry release since it does not transfer to the article along with the ink design layer and is said to comprise a thermoset polymeric resin, such as cross-linked resins selected from the group consisting of acrylic resins, polyamide resins, polyester resins, vinyl resins, epoxy resins, epoxy-acrylate resins, allyl resins,  
10 aldehyde resins, such as phenol-formaldehyde resins and the amino-aldehyde resins, e.g., urea formaldehyde or melamine formaldehyde, and combinations thereof.

The heat-transfer label of the foregoing Asnes patent also comprises a clear lacquer layer which is printed onto the release layer, a design print (which may include a number of ink layers) which is printed onto the clear lacquer layer, and a  
15 heat-activatable adhesive layer which is printed onto the design print and the clear lacquer layer. The Asnes patent explicitly teaches that "the design print and the adhesive print are both located marginally wholly within the lacquer print. The adhesive layer may be of the same area or larger in area than the design print so long as it is smaller in area than the lacquer print." The Asnes patent also teaches  
20 that "it is highly preferred that neither the release layer nor the lacquer layer, at least where they are in contact with each other, contain any substance which is oily or liquid at heat transfer temperature since the oil or liquid, like the wax in wax release layers, will part, leaving some on the lacquer surface and some on the removed release surface."

25 Another example of a heat-transfer label comprising a non-wax release layer is disclosed in U.S. Patent No. 4,935,300, inventors Parker et al., which issued June 19, 1990, and which is incorporated herein by reference. In the aforementioned Parker patent, the label, which is said to be particularly well-suited for use on high density polyethylene, polypropylene, polystyrene, polyvinylchloride and polyethylene  
30 terephthalate surfaces or containers, comprises a paper carrier web which is

overcoated with a layer of thermoplastic polyethylene. A protective lacquer layer comprising a polyester resin and a relatively small amount of a nondrying oil is printed onto the polyethylene layer. An ink design layer comprising a resinous binder base selected from the group consisting of polyvinylchloride, acrylics, polyamides and nitrocellulose is then printed onto the protective lacquer layer. A heat-activatable adhesive layer comprising a thermoplastic polyamide adhesive is then printed onto the ink design layer.

Although the above-described Parker label substantially reduces the wax-related effects discussed previously, said label does not quite possess the same release characteristics of heat-transfer labels containing a wax release layer. In fact, when put to commercial use, the polyethylene release layer of the Parker label was found to become adhesive when subjected to the types of elevated temperatures typically encountered during label transfer. Accordingly, another type of heat-transfer label differs from the Parker heat-transfer label in that a very thin layer or "skim coat" of carnauba wax is interposed between the polyethylene release layer and the protective lacquer layer to improve the release of the protective lacquer from the polyethylene-coated carrier web. The thickness of the skim coat corresponds to approximately 0.1-0.4 lbs. of the wax spread onto about 3000 square feet of the polyethylene release layer. The aforementioned "skim coat-containing" heat-transfer label also differs from the Parker label in that the heat-activatable adhesive of the "skim coat" label is printed over the entirety of the ink and protective lacquer layers, with the peripheral edges of the adhesive layer in direct contact with the wax skim coat.

An example of a "skim coat-containing" heat-transfer label of the type described above is disclosed in U.S. Patent No. 5,800,656, inventors Geurtsen et al., which issued September 1, 1998, and which is incorporated herein by reference. According to one embodiment, the Geurtsen label is designed for use on silane-treated glass containers of the type that are subjected to pasteurization conditions, the label including a support portion, a skim coat positioned on top of the support portion and a transfer portion positioned on top of the support portion. The support

portion includes a sheet of paper overcoated with a release layer of polyethylene. The transfer portion includes an organic solvent-soluble phenoxy resin protective lacquer layer, an organic solvent-soluble polyester resin ink layer over the protective lacquer layer, and a water-dispersible acrylic adhesive resin layer over the ink and protective lacquer layers and onto a surrounding portion of the skim coat.

Although the release properties of heat-transfer labels that include the aforementioned wax skim coat are much improved compared to similar heat-transfer labels lacking said wax skim coat, said labels do result in a portion of the wax skim coat being transferred to the article being decorated during label transfer. As a result, particularly when the labelled article is dark in color, a wax residue is often visible to the naked eye on the article around the peripheries of the label and in open-copy areas of the label. Such a wax residue, for the reasons discussed above, is undesirable from an aesthetic standpoint. In addition, said wax residue precludes the possibility of decorating articles, such as containers, with "wrap-around" labels of the type that completely encircle an object since the adhesive present at the trailing end of the label will not adhere to that portion of the article covered by the wax residue that is deposited with the leading end of the label.

Heat-transfer labels of the type that include the aforementioned wax skim coat are typically heated during the labelling process in order to cause the wax skim coat to soften, thereby facilitating label transfer. However, the heating temperatures needed to soften the wax skim coat have become increasingly more difficult to achieve as new decorating systems are being developed in which bottle throughput is higher and, consequently, the dwell time for heating is shorter, and the actual heating temperatures are lower.

Yet another example of a heat-transfer label comprising a non-wax release layer is disclosed in PCT Appln. No. PCT/US89/01731, inventors Abber et al., which was published February 8, 1990, and which is incorporated herein by reference. In the aforementioned Abber PCT application, a heat-transfer label for application to a plastic bottle or container is described that includes a carrier sheet and a transferable substrate affixed to the carrier sheet. The carrier sheet includes a nonwax thermoset

release layer coated over a paper sheet. The nonwax thermoset release layer is a noncellulosic alkyd resin formed by the crosslinking of an alkyd polymer with a methoxy melamine to produce a thermoset release. The alkyd polymer employed is preferably of the type formed by the thermosetting reaction product of a hydroxy-functional polyester with a drying oil. The transferable substrate affixed to the carrier sheet includes a nonwax lacquer transfer layer, an ink design layer over the lacquer transfer layer and a heat-activatable adhesive layer over the ink design layer.

Still another example of a heat-transfer label comprising a non-wax release layer is disclosed in PCT Appln. No. PCT/EP97/00642, inventors Ast, which was published on August 14, 1997, and which is incorporated herein by reference. In the aforementioned Ast PCT application, the release layer is made of polypropylene or polyethylene.

Still yet another example of a heat-transfer label comprising a non-wax release layer is disclosed in European Patent Appln. No. 824,251, inventors Brandt et al., which was published on February 18, 1998, and which is incorporated herein by reference. In the aforementioned Brandt EPO application, there is disclosed a heat-transfer label that is designed for use on a crate and that, once applied to a crate, can easily be removed therefrom in a washing process without the ink dissolving in the wash liquid. The foregoing Brandt label comprises a backing layer and a transfer layer, the transfer layer being releasably attached to the backing layer. The backing layer comprises a polypropylene film coated with a silicone layer. The transfer layer comprises a first containment layer in contact with the silicone layer, an ink layer on top of the first containment layer and marginally wholly within the first containment layer, a second containment layer on top of the ink layer and on top of the first containment layer, the first and second containment layers contacting one another outside the perimeter of the ink layer to form a closed envelope around the ink layer, and an adhesive layer on top of the first and second containment layers, the first containment layer and the adhesive layer contacting one another outside the perimeter of the second containment layer to form a closed envelope around the ink layer and second containment layer.

Unfortunately, the use of silicone as a release coating, as in the preceding example, presents certain problems or shortcomings. One of these problems is the difficulty of printing a label on a silicone release. Other possible problems or shortcomings are set forth in U.S. Patent No. 5,314,929, inventors Crivello et al., which issued May 24, 1994, and which is incorporated herein by reference. In the  
5      aforementioned Crivello patent, there is disclosed a silicone-free release coating composition adapted for use with adhesive tapes, said silicone-free coating composition being said to be rapidly curable and comprising (a) between about 50 and about 95 wt % of an alkyl vinyl ether monomer having the formula  $C_nH_{2n+1}O-CH-CH_2$  wherein n has a value of from 8 to 20, optionally containing a cationically  
10      polymerizable comonomer; (b) between about 5 and about 50 wt % of a multifunctional vinyl ether monomer and (c) between about 0.1 and about 10 wt % of an onium salt photoinitiator.

It is to be noted that the aforementioned Crivello patent neither teaches nor  
15      suggests the use of its release composition as a release coating in a heat-transfer label.



### SUMMARY OF THE INVENTION

It is an object of the present invention to provide a heat-transfer label that includes a novel release layer or release coating.

It is another object of the present invention to provide a heat-transfer label as described above whose release layer or release coating overcomes at least some of the problems associated with many of the heat-transfer label release layers or coatings described above.

It is still another object of the present invention to provide a heat-transfer label as described above whose release layer or release coating does not transfer, to any discernible degree observable to the naked eye, with the transfer portion of the label onto the article that is being labelled.

In furtherance of the above and other objects to be set forth or to become apparent from the description to follow, and according to one aspect of the invention, there is provided a heat-transfer label, said heat-transfer label comprising:

(a) a transfer portion, said transfer portion comprising

(i) an ink design layer, and

(ii) a heat-activatable adhesive layer over said ink design layer;

and

(b) a support portion, said transfer portion being positioned over said

support portion for transfer of the transfer portion from the support portion to an article under conditions of heat and pressure, said support portion comprising

(i) a carrier, and

(ii) a release coating positioned over said carrier, said release coating being made of a non-wax, non-silicone, thermoset release material, said release coating separating cleanly from said transfer portion with no visually discernible portion of said release coating being transferred to the article along with said transfer portion, said release coating having a total surface energy of about 25 to 35 mN/m (preferably about 30 mN/m), of which about 0.1 to 4 mN/m (preferably about 1.3 mN/m) is polar surface energy.

Said release coating preferably has a thickness of about 0.01 to 10 microns, more preferably about 0.02 to 1 micron, even more preferably about 0.1 micron. In addition, when analyzed by XPS (X-ray photoelectron spectroscopy), said coating preferably has a carbon content (by atomic %) of about 90 to 99.9% (preferably about 97%) and an oxygen content (by atomic %) of about 0.1 to 10% (preferably about 3%). Accordingly, said coating is predominantly a hydrocarbon in terms of its chemical makeup.

An example of the present support portion is a coated film structure preferably comprising:

(i) polymers selected from the group consisting of polyesters such as polyethylene terephthalate, polyethylene naphthylene; polyolefins such as polyethylene and polypropylene; and polyamides; wherein said polymers form a polymeric film surface; and

(ii) a primer coating comprising:

(A) functionalized  $\alpha$ -olefin containing copolymers, preferably acid functionalized  $\alpha$ -olefin containing copolymers, selected from the group consisting of ethylene/acrylic acid copolymers; ethylene/methacrylic acid copolymers; ethylene/vinylacetate/acrylic acid terpolymers; ethylene/methacrylamide copolymers; ethylene/glycidyl methacrylate copolymers; ethylene/dimethylaminoethyl methacrylate copolymers; ethylene/2-hydroxyethyl acrylate copolymers; propylene/acrylic acid copolymers; etc. and

(B) crosslinking agents selected from the group consisting of amino formaldehyde resins, polyvalent metal salts, isocyanates, blocked isocyanates, epoxy resins and polyfunctional aziridines;

(iii) wherein said primer coating is applied as a primer to the polymeric film surface, preferably in its amorphous or semi-oriented state and reacted with newly generated polymeric film surfaces formed during uniaxial or biaxial stretching and heat setting.

Preferably, the above-mentioned transfer portion further comprises a protective lacquer layer, said ink design layer being positioned over said protective

lacquer layer, said heat-activatable adhesive layer extending beyond the peripheries of said ink design layer and said protective lacquer layer. The release layer of the aforementioned support portion is preferably in direct contact with the transfer portion thereof; more preferably, the release layer is in direct contact with each of the

5 The heat-activatable adhesive layer of the foregoing heat-transfer label preferably comprises a polyester resin and more preferably additionally comprises an anti-blocking agent, such as a paraffinic wax. The protective lacquer layer of the foregoing heat-transfer label preferably comprises a phenoxy resin, more preferably

10 a cross-linked phenoxy resin. The ink design layer of the foregoing heat-transfer label preferably comprises a polyester resin.

According to another aspect of the invention, there is provided a heat-transfer label comprising:

(a) a transfer portion, said transfer portion comprising

15 (i) an ink design layer, and

(ii) a heat-activatable adhesive layer over said ink design layer;

and (b) a support portion, said transfer portion being positioned over said support portion for transfer of the transfer portion from the support portion to an article under conditions of heat and pressure, said support portion comprising

20 (i) a carrier, and

(ii) a release coating positioned over said carrier, said release coating being made of a non-wax, non-silicone, thermoset release material, said release coating separating cleanly from said transfer portion with no visually discernible portion of said release coating being transferred to the article along with

25 said transfer portion, said release coating having a carbon content (by atomic %) of about 90 to 99.9% (preferably about 97%) and an oxygen content (by atomic %) of about 0.1 to 10% (preferably about 3%), as measured by X-ray photoelectron spectroscopy.

The present invention is also directed to a method of decorating an article,

30 such as a clear glass container, said method comprising in one aspect the steps of:

(a) providing a heat-transfer label, said heat-transfer label comprising:

(i) a transfer portion, said transfer portion comprising

(A) an ink design layer, and

(B) a heat-activatable adhesive layer over said ink design

5 layer, and

(ii) a support portion, said transfer portion being positioned over said support portion for transfer of the transfer portion from the support portion to a glass article under conditions of heat and pressure, said support portion comprising

(A) a carrier, and

10 (B) a release layer positioned over said carrier, said release layer being made of a non-wax, non-silicone, thermoset release material, said release layer separating cleanly from said transfer portion with no visually discernible portion of said release layer being transferred to the glass article along with said transfer portion, said release layer having a total surface energy of about 25 to 35 mN/m (preferably about 30 mN/m), of which about 0.1 to 4 mN/m (preferably about 1.3 mN/m) is polar surface energy; and

(b) transferring said transfer portion from said support portion onto the article.

Said release coating preferably has a thickness of about 0.01 to 10 microns, more preferably about 0.02 to 1 micron, even more preferably about 0.1 micron. In addition, when analyzed by XPS (X-ray photoelectron spectroscopy), said coating preferably has a carbon content (by atomic %) of about 90 to 99.9% (preferably about 97%) and an oxygen content (by atomic %) of about 0.1 to 10% (preferably about 3%). Accordingly, said coating is predominantly a hydrocarbon in terms of its chemical makeup.

25 An example of the present support portion is the above-described coated film structure.

The present invention is also directed to a method of decorating an article, such as a clear glass container, said method comprising in another aspect the steps of:

30 (a) providing a heat-transfer label, said heat-transfer label comprising:

(i) a transfer portion, said transfer portion comprising  
(A) an ink design layer, and  
(B) a heat-activatable adhesive layer over said ink design  
layer, and

5 (ii) a support portion, said transfer portion being positioned over  
said support portion for transfer of the transfer portion from the support portion to a  
glass article under conditions of heat and pressure, said support portion comprising

(A) a carrier, and  
(B) a release layer positioned over said carrier, said  
10 release layer being made of a non-wax, non-silicone, thermoset release material, said  
release layer separating cleanly from said transfer portion with no visually discernible  
portion of said release layer being transferred to the glass article along with said  
transfer portion, said release layer having a carbon content (by atomic %) of about  
90 to 99.9% (preferably about 97%) and an oxygen content (by atomic %) of about  
15 0.1 to 10% (preferably about 3%), as measured by X-ray photoelectron spectroscopy;  
and

(b) transferring said transfer portion from said support portion onto the  
article.

The present invention is also directed to a transfer label, said transfer label  
20 differing from the above-described heat-transfer label in that a pressure-sensitive  
adhesive is used in place of the above-described heat-activatable adhesive.

For purposes of the present specification and claims, it is to be understood that  
certain terms used herein, such as "on" or "over," when used to denote the relative  
positions of two or more layers of a heat-transfer label, are primarily used to denote  
25 such relative positions in the context of how those layers are situated prior to transfer  
of the transfer portion of the label to an article since, after transfer, the arrangement  
of layers is inverted as those layers which were furthest removed from the associated  
support sheet are now closest to the labelled article.

Additional objects, as well as features, advantages and aspects of the present  
30 invention, will be set forth in part in the description which follows, and in part will be

obvious from the description or may be learned by practice of the invention. In the description, reference is made to the accompanying drawings which form a part thereof and in which is shown by way of illustration specific embodiments for practicing the invention. These embodiments will be described in sufficient detail to  
5 enable those skilled in the art to practice the invention, and it is to be understood that other embodiments may be utilized and that structural changes may be made without departing from the scope of the invention. The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the present invention is best defined by the appended claims.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

The accompanying drawings, which are hereby incorporated into and constitute a part of this specification, illustrate preferred embodiments of the invention and, together with the description, serve to explain the principles of the invention. In the drawings wherein like reference numerals represent like parts:

Fig. 1 is a schematic section view of one embodiment of a heat-transfer label constructed according to the teachings of the present invention;

Fig. 2 is a graph depicting the release values obtained in Example 2;

Fig. 3 is a graph depicting the release values obtained in Example 3;

Fig. 4 is a graph depicting the release values obtained in Example 4;

Fig. 5 is a graph depicting the surface oxygen content values obtained by X-ray photoelectron spectroscopy (XPS) in Example 5;

Fig. 6 is a graph depicting the release values obtained in Example 6; and

Fig. 7 is a graph depicting the surface oxygen content values obtained by X-ray photoelectron spectroscopy (XPS) in Example 7.

# **DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS**

Referring now to Fig. 1, there is shown a schematic section view of one embodiment of a heat-transfer label constructed according to the teachings of the present invention, said heat-transfer label being represented generally by reference numeral 11.

Label 11 comprises a support portion 13. Support portion 13, in turn, comprises a carrier 15. Carrier 15 preferably is a polymeric film selected from the group consisting of polyesters, such as polyethylene terephthalate, polyethylene naphthylene; polyolefins, such as polyethylene and polypropylene; and polyamides.

More preferably, carrier 15 is a clear plastic film of the type described above. As can readily be appreciated, one benefit to using a clear material as carrier 15 is that, if desired, one can inspect the quality of the printed matter of the label by looking at said printed matter through carrier 15 (from which perspective said printed matter appears as it will on the labelled article), as opposed to looking at said printed matter through the adhesive layer of the label (from which perspective said printed matter appears as the mirror image of what will appear on the labelled article).

A particularly preferred plastic material for use as carrier 15 is a clear polyester film, such as a clear polyethylene terephthalate (PET) film. This is because, at least as compared to some other plastic materials like polyethylene and polypropylene, polyester is a strong plastic material and makes a good substrate to be printed onto. In addition, unlike polyethylene, polyester does not tend to soften and become tacky at the types of temperatures typically encountered during heat-transfer. Typically, carrier 15 has a thickness of about 1-2 mil.

Support 13 also includes a release layer or coating 17, coating 17 preferably being applied directly on top of carrier 15. Coating 17 is a thermoset release material that separates cleanly from the below-described transfer portion of label 11 and is not transferred, to any visually discernible degree, with said transfer portion of label 11 onto an article being labeled. (For purposes of the present specification and claims, the term "visually discernible" is to be construed in terms of an unaided or



naked human eye.) Preferably, release coating 17 is clear for the same types of reasons given above in connection with carrier 15.

Coating 17 does not contain any waxes or any silicones, except to the limited extent provided below, and the terms "non-wax" and "non-silicone," when used in the present specification and claims to describe and to define the present release layer or coating, are defined herein to exclude from said release layer or coating the presence of any and all waxes and silicones not encompassed by the limited exceptions provided below.

Coating 17 preferably has a thickness of about 0.01 to 10 microns, more preferably about 0.02 to 1 micron, even more preferably about 0.1 micron. In addition, coating 17 preferably has a total surface energy of about 25 to 35 mN/m (preferably about 30 mN/m), of which about 0.1 to 4 mN/m (preferably about 1.3 mN/m) is polar surface energy. Furthermore, when analyzed by XPS (X-ray photoelectron spectroscopy), coating 17 preferably has a carbon content (by atomic %) of about 90 to 99.9% (preferably about 97%) and an oxygen content (by atomic %) of about 0.1 to 10% (preferably about 3%). Accordingly, coating 17 is predominantly a hydrocarbon in its chemical makeup.

An example of a coated polymer film suitable for use as support 13 of the present invention is available from DuPont Corp. (Wilmington, DE) as product number 140AXM 701 (140 gauge coated polyester film). Other coated polymer films which may be used as support 13 are described in European Patent Application No. 819,726, published January 21, 1998, which document is incorporated herein by reference. The aforementioned European patent application teaches a coated film structure preferably comprising:

(i) polymers selected from the group consisting of polyesters such as polyethylene terephthalate, polyethylene naphthylene; polyolefins such as polyethylene and polypropylene; and polyamides; wherein said polymers form a polymeric film surface; and

(ii) a primer coating comprising:

(A) functionalized  $\alpha$ -olefin containing copolymers, preferably acid functionalized  $\alpha$ -olefin containing copolymers, selected from the group consisting of ethylene/acrylic acid copolymers; ethylene/methacrylic acid copolymers; ethylene/vinylacetate/acrylic acid terpolymers; ethylene/methacrylamide copolymers; ethylene/glycidyl methacrylate copolymers; ethylene/dimethylaminoethyl methacrylate copolymers; ethylene/2-hydroxyethyl acrylate copolymers; propylene/acrylic acid copolymers; etc. and

(B) crosslinking agents selected from the group consisting of amino formaldehyde resins, polyvalent metal salts, isocyanates, blocked isocyanates, epoxy resins and polyfunctional aziridines;

(iii) wherein said primer coating is applied as a primer to the polymeric film surface, preferably in its amorphous or semi-oriented state and reacted with newly generated polymeric film surfaces formed during uniaxial or biaxial stretching and heat setting.

Although the above-described polymeric film surface is preferably formed of a polyester, a polyolefin, or a polyamide, it may be formed from any material capable of being formed into a sheet or film. The polymeric film surface should be capable of binding or reacting with an acid-functionalized  $\alpha$ -olefin copolymer to form a modified film base.

The above-mentioned polymer films can be manufactured by an extrusion process, such as a cast film or blown film process. In a cast film process, the polymer resin is first heated to a molten state and then extruded through a wide slot die in the form of an amorphous sheet. The sheet-like extrudate is rapidly cooled or "quenched" to form a cast sheet of polyester by contacting and traveling partially around a polished, revolving casting drum. Alternatively, the extrudate can be blown in a conventional blown film process. Regardless of the process, however, the polyester sheet is preferably uniaxially or biaxially (preferably biaxially) stretched in the direction of film travel (machine direction) and/or perpendicular to the machine direction (traverse direction), while being heated to a temperature in the range of from about 80°C to 160°C, preferably about 90°C to 110°C, the degree of stretching may

range from 3.0 to 5.0 times the original cast sheet unit dimension, preferably from about 3.2 to about 4.2 times the original cast sheet dimension. Reaction with the newly generated polymer film surfaces formed during stretching preferably occurs at temperatures about 130°C or higher.

5 Additives such as coating aids, wetting aids such as surfactants (including silicone surfactants), slip additives, antistatic agents can be incorporated into the primer coating in levels from 0 to 50% based on the total weight of additive-free coating solids.

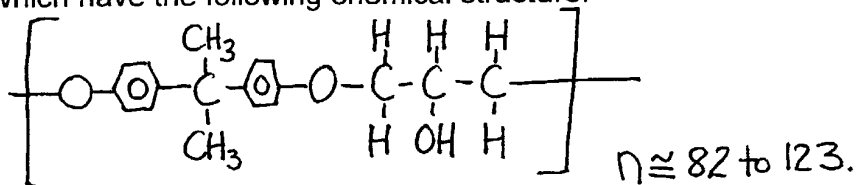
10 The above-described primer coating may additionally be applied to the bottom surface of the polymeric film for use in preventing the adhesive layer of a transfer portion from adhering to the underside of carrier 15 when a label assembly comprising a plurality of transfer portions on a single support portion 13 is wound into a roll.

15 Label 11 further comprises a transfer portion 21 (it being understood that a plurality of transfer portions 21 may be spaced apart on a single support portion 13). Transfer portion 21, in turn, preferably includes (i) a protective lacquer layer 23 printed directly on top of a desired area of release layer 17, (ii) an ink design layer 25 printed directly onto a desired area of lacquer layer 23, and (iii) a heat-activatable adhesive layer 27 printed directly onto ink design layer 25, any exposed portions of  
20 lacquer layer 23 and a surrounding area of release layer 17.

Where the article being labeled is a glass article, such as a silane-treated glass container, protective lacquer layer 23 preferably is a phenoxy protective lacquer layer, such as that described in U.S. Patent No. 5,800,656, or is a cross-linked phenoxy lacquer layer such as that disclosed in U.S. Patent Application Serial No.  
25 09/093,150, which is incorporated herein by reference. This is because phenoxy protective lacquer layers tend to possess the high degree of scuff resistance and chemical resistance preferred for glass articles. It should be understood, however, that release layer 17 releases well from a variety of protective lacquer layers of different compositions and that other types of protective lacquer resins may also be

suitable for use in layer 23 depending upon the type of article being labeled and the use to which the decorated article is to be put.

Examples of phenoxy lacquer resins suitable for use in the aforementioned phenoxy or cross-linked phenoxy protective lacquer layer include the PAPHEN  
 5 Phenoxy Resins (Phenoxy Specialties, Rock Hill, SC - a division of InChem Corp.), which have the following chemical structure:



10 A particularly preferred PAPHEN Phenoxy Resin is PKHH, a medium weight grade of the above structure which, at 40% solids, by weight, in methyl ethyl ketone (MEK), has a solution viscosity of 4500 to 7000 mPa•s(cP). Examples of a suitable cross-linker for cross-linking the aforementioned phenoxy resin include partially methylated  
 15 melamine-formaldehyde resins of the type present in the CYMEL 300 series of partially methylated melamine-formaldehyde resin solutions (Cytec, Industries, Inc., West Paterson, NJ) and, in particular, CYMEL 370 partially methylated melamine-formaldehyde resin solution (88±2% nonvolatiles, iBuOH solvent). Preferably, the solids of the aforementioned CYMEL 370 resin solution constitute no more than  
 20 about 5%, by weight, of lacquer layer 23 (with the remainder of lacquer layer 23 being the aforementioned phenoxy resin) since amounts of CYMEL 370 in excess thereof may cause lacquer layer 23 to become tacky.

To form a cross-linked phenoxy lacquer layer 23, a lacquer composition comprising the above-identified phenoxy lacquer resin, a suitable cross-linker and  
 25 one or more suitable volatile solvents are deposited onto a desired area of release layer 17, preferably by gravure printing or a similar technique. After deposition of the lacquer composition onto the desired area of layer 17, the volatile solvent(s) evaporate(s), leaving only the non-volatile components thereof to make up lacquer layer 23. In a preferred embodiment, the lacquer composition comprises about 20%,  
 30 by weight, PKHH; about 1%, by weight, CYMEL 370 resin solution; about 59%, by weight, methyl ethyl ketone; and about 20%, by weight, toluene.

Ink design layer 25 of transfer portion 21, which layer may actually comprise either a single ink layer or a plurality of ink layers, may be made using one or more conventional inks, such as polyester inks, polyester/vinyl inks, polyamide inks and/or acrylic inks, as well as the phenoxy ink described in commonly-assigned, co-pending U.S.S.N. 09/204,424, which is incorporated herein by reference. Such inks typically comprise a resin of the type described above, a suitable pigment or dye, and one or more suitable volatile solvents. Ink design layer 25 is formed in the conventional manner by depositing, preferably by gravure printing, one or more ink compositions of the type described above onto one or more desired areas of lacquer layer 23 and, thereafter, allowing the volatile solvent(s) of the ink composition(s) to evaporate, leaving only the non-volatile ink components to form layer 25.

An example of polyester ink suitable for use in forming layer 25 comprises 18 wt % ViTEL®2700 (a copolyester resin commercially available from Bostik, Middleton, MA, having a high tensile strength (6700 psi) and a low elongation (3% elongation)), 6 wt % pigment, 30.4 wt % n-propyl acetate and 45.6 wt % toluene. An example of another suitable polyester ink comprises ViTEL® 2300 polyester resin (a copolyester resin also commercially available from Bostik having a high tensile strength (8000 psi) and a low elongation (7% elongation)).

Adhesive layer 21 preferably comprises a heat-activatable, polyester-based adhesive; however, other types of heat-activatable adhesives, such as water-based acrylic adhesives (see, for example, U.S.S.N. 09/093,153, which application is incorporated herein by reference), phenoxy adhesives (see, for example, U.S.S.N. 09/189,277, which application is incorporated herein by reference) and the like, are also suitable for use as layer 27. (In fact, certain pressure-sensitive adhesives may also be used, instead of heat-activatable adhesives, in forming adhesive layer 27.) Adhesive layer 27 is preferably formed by depositing, by gravure printing or the like, onto (i) ink layer 25, (ii) exposed portions of lacquer layer 23 and (iii) a surrounding area of release coating 17 an adhesive composition comprising an adhesive resin and one or more volatile solvents and then evaporating the volatile component(s) of

the composition (for example, by oven-heating for 30 seconds at 200°F), leaving only the non-volatile solid component(s) thereof to form layer 27.

An example of a suitable polyester-based adhesive composition for use in forming a polyester-based adhesive of the type mentioned above comprises about 10.7 wt % of ViTEL® 2700 polyester resin, about 10.7 wt% of ViTEL® 2300, about 1.1 wt % of BENZOFLEX® S404 glyceryl tribenzoate plasticizer (commercially available from Velsicol Chemical Corporation, Chicago, IL), about 1.1 wt % HULS 512 adhesion promoter (commercially available from Sivent Inc., Piscataway, NJ), about 19.20 wt % toluene and about 57.10 wt % methyl ethyl ketone.

Adhesive layer 27 may additionally include an anti-blocking agent for use in preventing adhesive layer 27 from adhering to the underside of carrier 15 when a label assembly comprising a plurality of transfer portions 21 on a single support portion 13 is wound into a roll. The inclusion of said anti-blocking agent in said adhesive may be particularly desirable in those instances in which adhesive layer 27 and carrier 15 have a high degree of adherence to one another, such as where adhesive layer 27 comprises a polyester-based adhesive and carrier 15 is a polyester film. An example of a suitable anti-blocking agent is a wax, such as a paraffinic wax, which is added to the adhesive composition used to form adhesive layer 27 in an amount constituting about 1 wt % of said composition.

As seen in the examples below, in those instances in which a wax is included in adhesive layer 27, a percentage of said wax is believed to migrate to other layers of label 11, including to the interface between release layer 17 and protective lacquer layer 23.

Moreover, as also seen in the examples below, said wax migration appears to improve the release of protective lacquer layer 23 and adhesive layer 27 from release layer 17. Nevertheless, notwithstanding the presence of said minute quantities of wax at the surface of release layer 17, the present inventors did not detect any visually discernible amount of wax that was transferred from the release layer to the labeled article. Any such quantities of migrated wax do not render a release layer of the present invention outside the meaning of the term "non-wax."

Label 11 may be used in the conventional manner by contacting adhesive layer 27 with a desired article, such as a pre-heated (preferably to about 275-300°F), silane-treated clear glass container, while applying sufficient heat to the bottom of carrier 15 (e.g., using a platen heated to about 300-350°F) so as to cause transfer portion 21 to be released from support portion 13 and so as to cause adhesive layer 27 to become heat-activated for bonding to the desired article. Prior to label transfer, the label construction is preferably pre-heated sufficiently so that the adhesive layer is heated to about 170-250°F.

The present inventors have noted that, when label 11 is used to decorate silane-treated, clear glass containers, a good degree of label adherence and scuff resistance is achieved (i.e., at least about 5H pencil hardness, as measured by ASTM standard D3363-92a for film hardness on a substrate).

One of the advantages associated with the use of a release layer like release layer 17 is that transfer portion 21 of label 11 can be of the "wrap-around" variety that completely encircles a container.

The present invention may more clearly be understood by reference to the following examples, it being understood that such examples are illustrative and not to be considered as limiting of the invention.

#### EXAMPLE 1

Four heat-activatable adhesive or protective lacquer films were coated onto each of two types of coated polyethylene terephthalate (PET) film samples (DuPont 92AXT coated polyester film), said two types of coated PET film samples being similar to DuPont 140AXM 701 coated polyester film (and differing most notably from DuPont 140AXM 701 coated polyester film in that the two coated PET film samples comprised 92 gauge PET film, instead of 140 gauge PET film). The first of said adhesive or protective films applied to said two coated PET film samples was a polyester adhesive obtained by (i) depositing onto the coated PET film an adhesive composition comprising about 10.7 wt % of ViTEL® 2700 polyester resin, about 10.7 wt% of ViTEL® 2300, about 1.1 wt % of BENZOFLEX® S404 glyceryl tribenzoate plasticizer, about 1.1 wt % HULS 512 adhesion promoter, about 19.20 wt % toluene

and about 57.10 wt % methyl ethyl ketone and (ii) drying the resulting product at 70°C for 5 minutes to evaporate the volatile components thereof. The second of said films was an acrylic adhesive (see U.S.S.N. 09/093,153, which is incorporated herein by reference) obtained by (i) depositing onto the coated PET film an adhesive composition comprising about 75 wt % of RHOPLEX® GL-618 emulsion, about 17.5 wt % isopropyl alcohol, about 7.5 wt % of a 4% solution of NH<sub>4</sub>OH, and about 1 wt % of Triton GR-5M dioctyl sodium sulfosuccinate surfactant and (ii) drying the resulting product at 70°C for 5 minutes to evaporate the volatile components thereof. The third of said films was a water-based phenoxy adhesive (see U.S.S.N. 09/189,277, which is incorporated herein by reference) obtained by (i) depositing onto the coated PET film an adhesive composition comprising about 34 wt % PAPHEN® PKHW-34 phenoxy dispersion, about 12 wt % of co-solvent (2-4% butanol, 5-7% propylene glycol n-propyl ether and 1-3% dimethyl ethyl amine), and about 54 wt % water and (ii) drying the resulting product at 70°C for 5 minutes to evaporate the volatile components thereof. The fourth of said films was a solvent-based phenoxy protective lacquer obtained by (i) depositing onto the coated PET film an adhesive composition comprising about 25 wt % PKHH, about 46.6 wt % methyl ethyl ketone, about 23.4 wt % toluene and about 5 wt % Dowanol PM propylene glycol methylether and (ii) drying the resulting product at 70°C for 5 minutes to evaporate the volatile components thereof.

The four films were removed from each of the two types of coated PET samples, and the film surfaces from each coated PET sample that contacted the sample were analyzed by XPS to determine whether there was any release material contamination from the samples on the film surfaces. Areas from the two types of coated PET samples which were not coated by film were also analyzed by XPS as control samples. The results are shown below in TABLE I.

TABLE I

			Atomic %		
Sample	C	O	Na	N	S



5	Uncoated Sample 1	97.6	2.4	-	-	-
	Phenoxy Protective Lacquer from Sample 1	85.4	14.6	-	-	-
	Phenoxy Adhesive from Sample 1	83.5	16.5	-	-	-
10						
15	Polyester Adhesive from Sample 1	80.4	19.6	-	-	-
20	Acrylic Adhesive from Sample 1	71.2	22.9	0.5	4.2	1.2
25	Uncoated Sample 2	96.3	3.7	-	-	-
	Phenoxy Adhesive from Sample 2	82.7	17.2	-	-	-

	Polyester Adhesive from Sample 2	79.8	20.2	-	-	-
5	Acrylic Adhesive from Sample 2	69.7	23.6	0.8	4.6	1.3

10 XPS measurements of the coated surfaces of the two types of coated PET samples showed 97.6% carbon/2.4% oxygen and 96.3% carbon/3.7% oxygen, respectively. This is consistent with a predominantly hydrocarbon surface. The surface compositions of the four films deposited onto the two types of coated PET samples showed no significant change after having been peeled from the two types  
15 of coated PET samples. This indicates that the adhesive/protection layers were free of contamination from the support.

#### EXAMPLE 2

The four types of heat-activatable adhesive or protective lacquer films described in Example 1 were formed on each of the two types of coated PET support  
20 samples of Example 1, and the respective release values for each were measured with a TLMI Release Tester (see FINAT Test Method No. 3 of the FINAT Technical Handbook, 4<sup>th</sup> Edition) at a peel angle of 15 degrees using 810 tape at a peel rate of 12 in/min at room temperature. The results are shown below in TABLE II and are depicted graphically in Fig. 2.

TABLE II

Sample	Release Value (g/in)	Average (g/in)
Phenoxy protective lacquer on Sample 2	297, 335, 295, 268, 296, 293, 296, 243	290

5	Phenoxy adhesive on Sample 2	215, 181, 212, 192, 188, 201, 191, 211, 195	198
	Polyester adhesive on Sample 2	162, 162, 174, 173, 158, 197, 188	173
	Acrylic adhesive on Sample 2	117, 116, 119, 99, 130	116
10	Phenoxy protective lacquer on Sample 1	224, 221, 218, 229, 243, 223, 219, 218	224
	Phenoxy adhesive on Sample 1	169, 149, 144, 158, 154, 159, 172, 172	159
	Polyester adhesive on Sample 1	166, 123, 118, 144, 142, 164, 154	144
15	Acrylic adhesive on Sample 1	120, 93, 99, 103, 104, 99	103

The average release values for Sample 2 were higher than that for Sample 1. It is believed that this higher release force is attributable to the higher oxygen content in Sample 2 than in Sample 1 (3.7% vs. 2.4% as detected by XPS).

### EXAMPLE 3

The phenoxy protective lacquer, phenoxy adhesive and polyester adhesive films described in Example 1 were formed on each of the two types of support samples of Example 1, and the respective release values for each were measured, as in Example 2, with a 15 degree tester with 810 tape at 12 in/min (i) at room temperature (R.T.) and (ii) at room temperature after heating at 110°C for 20 minutes (110°C). The results are shown below in TABLE III and are depicted graphically in Fig. 3.

TABLE III

		RELEASE VALUES (g/in)		
	Sample 2 at R.T.	Sample 2 at 110°C	Sample 1 at R.T.	Sample 1 at 110°C
5 Phenoxy Protective Lacquer	290	876	224	784
Phenoxy Adhesive	198	272	159	277
10 Polyester Adhesive	188	504	144	448

The above data indicates that the phenoxy protective lacquer experienced the biggest heat-related release increase among the three films while the phenoxy adhesive experienced the smallest release increase. The 20-minute heating was used to simulate severe aging conditions for a label. In reality, a label experiences heat at 110°C for less than a second.

## EXAMPLE 4

A plurality of samples of a first type of label construction were prepared, said first type of label construction comprising a Sample 1-type support, a phenoxy protective lacquer layer of the type described above printed on top of said support, an ink layer printed on top of said protective lacquer layer, and a polyester adhesive of the type described above comprising a paraffinic wax printed on top of said support, said protective lacquer layer and said ink layer. In addition, a plurality of samples of a second type of label construction were prepared, said second type of label construction differing from said first type of label construction in that said second label construction did not include an adhesive layer. Six samples of each type of label construction were tested one week after printing using the above-described

degree release test at room temperature. These samples were identified as "Room Temp." Another six samples of each were tested after heating at 110°C for 20 minutes. These samples were identified as "110C/20 min." Additional batches of six samples of each label construction were heated in a 70°C oven for 1, 2 and 4 weeks, respectively, with adhesive side up to prevent blocking and then tested. These samples were identified as "70C/1 week," "70C/2 week," and "70C/4 week." Still another six samples of each label construction were stored at room temperature for six weeks and then tested. These samples were identified as "RT 6." The release values obtained (g/inch) from the above-described testing are set forth below in TABLE IV and are shown graphically in Fig. 4.

TABLE IV

Constru- ction	Room Temp.	110C/20 min	70C/1 week	70C/2 week	70C/4 week	RT/6
First type	78	191	244	255	374	119
Second type	183	733	519	626	631	249

As can be seen, the heat-aged condition increased the release value for both types of label constructions.

## EXAMPLE 5

XPS measurements were obtained for the adhesive layer, the protective lacquer layer and the release coating of the support portion of the first type of label construction described in Example 4. The oxygen % values from these measurements are set forth below in TABLE V and are depicted graphically in Fig. 5. (Virgin film denotes the surface of the adhesive or protective lacquer material cast on a substrate or the virgin release coating without any material contamination.)

TABLE V

	Virgin film	Room Temp	110C/2 0 min	70C/1 week	70C/2 week	70C/4 week	RT/6
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Adhes- ive	22.4	16.0	13.6	15.3	16.7	18.0	18.1
Protect- ive	17.5	10.0	6.8	5.0	6.1	6.2	11.6
Relea- se	3.6	2.4	1.8	2.2	2.1	2.6	2.6

As can be seen from the above data, the wax from the adhesive layer migrated to the protective lacquer and release layers.

#### EXAMPLE 6

A plurality of samples of a third type of label construction were prepared, said third type of label construction differing from said first type of label construction in that the support used was similar, but not identical, to the support used in the first type of label construction and in that the adhesive used was the polyester adhesive of Example 1 (which does not include a paraffinic wax or the like). In addition, a plurality of samples of a fourth type of label construction were prepared, said fourth type of label construction differing from said third type of label construction in that said fourth label construction included the acrylic adhesive layer of Example 1. Several samples of each type of label construction were tested one week after printing using the above-described 15 degree release test at room temperature. These samples were identified as "Room Temp." Another group of samples of each type of label construction were tested after heating at 110°C for 20 minutes. These samples were identified as "110C/20 min." Another group of several samples of each label construction were heated in a 70°C oven for 1 week with adhesive side up to prevent blocking and then tested. These samples were identified as "70C/1 week." The results of the above-described testing are shown graphically in Fig. 6.

#### EXAMPLE 7

XPS measurements were obtained for the adhesive layer, the protective lacquer layer and the release coating of the support portion of the third type of label construction described in Example 6. The oxygen % values from these

measurements are depicted graphically in Fig. 7. (Virgin film denotes the surface of the adhesive or protective lacquer material cast on a substrate or the virgin release coating without any material contamination.)

The embodiments of the present invention recited herein are intended to be merely exemplary and those skilled in the art will be able to make numerous variations and modifications to it without departing from the spirit of the present invention. For example, it should be appreciated that one may add, either directly or through trans-layer migration, trace or non-functional minor amounts of waxes or silicones to the release layer described herein as "non-wax" and "non-silicone" without being outside the scope of applicants' invention. Thus, the terms "non-wax" and "non-silicone" as used herein is intended to embrace this possibility. All such variations and modifications are intended to be within the scope of the present invention as defined by the claims appended hereto.

**WHAT IS CLAIMED IS:**

1. A heat-transfer label, said heat-transfer label comprising:

(a) a transfer portion, said transfer portion comprising

(i) an ink design layer, and

(ii) a heat-activatable adhesive layer over said ink design layer;

and

(b) a support portion, said transfer portion being positioned over said support portion for transfer of the transfer portion from the support portion to an article under conditions of heat and pressure, said support portion comprising

(i) a carrier, and

(ii) a first release coating positioned over said carrier, said first release coating being made of a non-wax, non-silicone, thermoset release material, said first release coating separating cleanly from said transfer portion with no visually discernible portion of said first release coating being transferred to the article along with said transfer portion, said first release coating having a total surface energy of about 25 to 35 mN/m, of which about 0.1 to 4 mN/m is polar surface energy.

2. The heat-transfer label as claimed in claim 1 wherein said first release coating has a total surface energy of about 30 mN/m, of which about 1.3 mN/m.

3. The heat-transfer label as claimed in claim 1 wherein said first release coating is in direct contact with said transfer portion.

4. The heat-transfer label as claimed in claim 1 wherein said transfer portion further comprises a protective lacquer layer, said ink design layer being positioned over said protective lacquer layer, said first release coating being in direct contact with said protective lacquer layer.

5. The heat-transfer label as claimed in claim 1 wherein said first release coating has a thickness of about 0.01 to 10 microns.

6. The heat-transfer label as claimed in claim 5 wherein said first release coating has a thickness of about 0.02 to 1 micron.

7. The heat-transfer label as claimed in claim 6 wherein said first release coating has a thickness of about 0.1 micron.



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17. The heat-transfer label as claimed in claim 16 wherein said acid functionalized  $\alpha$ -olefin containing copolymer is selected from the group consisting of ethylene/acrylic acid copolymers; ethylene/methacrylic acid copolymers; ethylene/vinylacetate/acrylic acid terpolymers; ethylene/methacrylamide copolymers; ethylene/glycidyl methacrylate copolymers; ethylene/dimethylaminoethyl methacrylate copolymers; ethylene/2-hydroxyethyl acrylate copolymers; and propylene/acrylic acid copolymers.

18. The heat-transfer label as claimed in claim 15 wherein said crosslinking agent is selected from the group consisting of amino formaldehyde resins, polyvalent metal salts, isocyanates, blocked isocyanates, epoxy resins and polyfunctional aziridines.

19. The heat-transfer label as claimed in claim 1 wherein said heat-activatable adhesive comprises a polyester resin.

20. The heat-transfer label as claimed in claim 19 wherein said heat-activatable adhesive further comprises a wax.

21. The heat-transfer label as claimed in claim 20 wherein said wax is a paraffinic wax.

22. The heat-transfer label as claimed in claim 4 wherein said protective lacquer layer comprises a phenoxy resin.

23. The heat-transfer label as claimed in claim 1 wherein said support portion further comprises a second release coating, said second release coating being positioned under said carrier.

24. The heat-transfer label as claimed in claim 23 wherein said second release coating is substantially identical in composition to said first release coating.

25. The heat-transfer label as claimed in claim 1 wherein said carrier and said first release coating are optically clear.

26. A heat-transfer label, said heat-transfer label comprising:

- (a) a transfer portion, said transfer portion comprising
  - (i) an ink design layer, and

(ii) a heat-activatable adhesive layer over said ink design layer;  
and

(b) a support portion, said transfer portion being positioned over said support portion for transfer of the transfer portion from the support portion to an article under conditions of heat and pressure, said support portion comprising

(i) a carrier, and

(ii) a first release coating positioned over said carrier, said first release coating being made of a non-wax, non-silicone, thermoset release material, said first release coating separating cleanly from said transfer portion with no visually discernible portion of said first release coating being transferred to the article along with said transfer portion, said first release coating having a carbon content (by atomic %) of about 90 to 99.9% and an oxygen content (by atomic %) of about 0.1 to 10%, as measured by X-ray photoelectron spectroscopy.

27. The heat-transfer label as claimed in claim 26 wherein said first release coating has a carbon content (by atomic %) of about 97% and an oxygen content (by atomic %) of about 3%, as measured by X-ray photoelectron spectroscopy.

28. The heat-transfer label as claimed in claim 26 wherein said first release coating exhibits a release value of about 70-350 g/inch when an adhesive film which has been applied thereto is removed therefrom at a 15 degree angle using Scotch 810 tape at a rate of 12 in/min at room temperature.

29. The heat-transfer label as claimed in claim 28 wherein said first release coating exhibits a release value of about 125-200 g/inch when an adhesive film which has been applied thereto is removed therefrom at a 15 degree angle using Scotch 810 tape at a rate of 12 in/min at room temperature.

30. The heat-transfer label as claimed in claim 26 wherein said first release coating has a thickness of about 0.01 to 10 microns.

31. The heat-transfer label as claimed in claim 30 wherein said first release coating has a thickness of about 0.02 to 1 micron.

32. The heat-transfer label as claimed in claim 31 wherein said first release coating has a thickness of about 0.1 micron.

33. The heat-transfer label as claimed in claim 26 wherein said carrier is made of a polymer selected from the group consisting of polyesters, polyolefins and polyamides.

34. The heat-transfer label as claimed in claim 33 wherein said first release coating is made by (i) applying to the carrier in its amorphous or semi-oriented state a composition comprising (a) a functionalized  $\alpha$ -olefin containing copolymer and (B) a crosslinking agent; and (ii) reacting said composition with the carrier during uniaxial or biaxial stretching and heat setting.

35. The heat-transfer label as claimed in claim 26 wherein said support portion further comprises a second release coating, said second release coating being positioned under said carrier.

36. The heat-transfer label as claimed in claim 35 wherein said second release coating is substantially identical in composition to said first release coating.

37. The heat-transfer label as claimed in claim 26 wherein said carrier and said first release coating are optically clear

38. A transfer label comprising:

(a) a transfer portion, said transfer portion comprising

(i) an ink design layer, and

(ii) a pressure-sensitive adhesive layer over said ink design layer;

and

(b) a support portion, said transfer portion being positioned over said support portion for transfer of the transfer portion from the support portion to an article under conditions of pressure, said support portion comprising

(i) a carrier, and

(ii) a first release coating positioned over said carrier, said first release coating being made of a non-wax, non-silicone, thermoset release material, said first release coating separating cleanly from said transfer portion with no visually discernible portion of said first release coating being transferred to the article along with said transfer portion, said first release coating having a total surface energy of about 25 to 35 mN/m, of which about 0.1 to 4 mN/m is polar surface energy.

39. The transfer label as claimed in claim 38 wherein said first release coating has a total surface energy of about 30 mN/m, of which about 1.3 mN/m is polar surface energy.

40. The transfer label as claimed in claim 38 wherein said first release coating is in direct contact with said transfer portion.

41. The transfer label as claimed in claim 38 wherein said transfer portion further comprises a protective lacquer layer, said ink design layer being positioned over said protective lacquer layer, said first release coating being in direct contact with said protective lacquer layer.

42. The transfer label as claimed in claim 38 wherein said first release coating has a thickness of about 0.01 to 10 microns.

43. The transfer label as claimed in claim 42 wherein said first release coating has a thickness of about 0.02 to 1 micron.

44. The transfer label as claimed in claim 43 wherein said first release coating has a thickness of about 0.1 micron.

45. The transfer label as claimed in claim 38 wherein said first release coating has a carbon content (by atomic %) of about 90 to 99.9% and an oxygen content (by atomic %) of about 0.1 to 10%, as measured by X-ray photoelectron spectroscopy.

46. The transfer label as claimed in claim 45 wherein said first release coating has a carbon content (by atomic %) of about 97% and an oxygen content (by atomic %) of about 3%, as measured by X-ray photoelectron spectroscopy.

47. The transfer label as claimed in claim 38 wherein said carrier is made of a polymer selected from the group consisting of polyesters, polyolefins and polyamides.

48. The transfer label as claimed in claim 38 wherein said carrier is made of a polymer selected from the group consisting of polyethylene terephthalate and polyethylene naphthylene.

49. The transfer label as claimed in claim 38 wherein said carrier is made of a polymer selected from the group consisting of polyethylene and polypropylene.

50. The transfer label as claimed in claim 49 wherein said first release coating is made by (i) applying to the carrier in its amorphous or semi-oriented state a composition comprising (a) a functionalized  $\alpha$ -olefin containing copolymer and (B) a crosslinking agent; and (ii) reacting said composition with the carrier during uniaxial or biaxial stretching and heat setting.

51. The transfer label as claimed in claim 50 wherein said functionalized  $\alpha$ -olefin containing copolymer is an acid functionalized  $\alpha$ -olefin containing copolymer.

52. The transfer label as claimed in claim 51 wherein said acid functionalized  $\alpha$ -olefin containing copolymer is selected from the group consisting of ethylene/acrylic acid copolymers; ethylene/methacrylic acid copolymers; ethylene/vinylacetate/acrylic acid terpolymers; ethylene/methacrylamide copolymers; ethylene/glycidyl methacrylate copolymers; ethylene/dimethylaminoethyl methacrylate copolymers; ethylene/2-hydroxyethyl acrylate copolymers; and propylene/acrylic acid copolymers.

53. The transfer label as claimed in claim 52 wherein said crosslinking agent is selected from the group consisting of amino formaldehyde resins, polyvalent metal salts, isocyanates, blocked isocyanates, epoxy resins and polyfunctional aziridines.

54. The transfer label as claimed in claim 40 wherein said protective lacquer layer comprises a phenoxy resin.

55. The transfer label as claimed in claim 38 wherein said support portion further comprises a second release coating, said second release coating being positioned under said carrier.

56. The transfer label as claimed in claim 55 wherein said second release coating is substantially identical in composition to said first release coating.

57. A transfer label, said transfer label comprising:

(a) a transfer portion, said transfer portion comprising

(i) an ink design layer, and

(ii) a pressure-sensitive adhesive layer over said ink design layer;

and

(b) a support portion, said transfer portion being positioned over said support portion for transfer of the transfer portion from the support portion to an article under conditions of pressure, said support portion comprising

(i) a carrier, and

(ii) a first release coating positioned over said carrier, said first release coating being made of a non-wax, non-silicone, thermoset release material, said first release coating separating cleanly from said transfer portion with no visually discernible portion of said first release coating being transferred to the article along with said transfer portion, said first release coating having a carbon content (by atomic %) of about 90 to 99.9% and an oxygen content (by atomic %) of about 0.1 to 10%, as measured by X-ray photoelectron spectroscopy.

58. A transfer label as claimed in claim 57 wherein said first release coating has a carbon content (by atomic %) of about 97% and an oxygen content (by atomic %) of about 3%, as measured by X-ray photoelectron spectroscopy.

59. The transfer label as claimed in claim 57 wherein said first release coating has a thickness of about 0.01 to 10 microns.

60. The transfer label as claimed in claim 57 wherein said carrier is made of a polymer selected from the group consisting of polyesters, polyolefins and polyamides.

61. The transfer label as claimed in claim 60 wherein said first release coating is made by (i) applying to the carrier in its amorphous or semi-oriented state a composition comprising (a) a functionalized  $\alpha$ -olefin containing copolymer and (B) a crosslinking agent; and (ii) reacting said composition with the carrier during uniaxial or biaxial stretching and heat setting.

62. The transfer label as claimed in claim 57 wherein said support portion further comprises a second release coating, said second release coating being positioned under said carrier.

63. The transfer label as claimed in claim 62 wherein said second release coating is substantially identical in composition to said first release coating.

64. A method of decorating an article, said method comprising the steps of:

- (a) providing the heat-transfer label of claim 1; and
- (b) transferring said transfer portion from said support portion to the article.

5           65. The method as claimed in claim 64 wherein the article is a container made of a material selected from the group consisting of glass, a hard plastic (e.g., polypropylene, polystyrene, styrene acrylonitrile, polyethylene terephthalate and PEN) and metal.

66. The method as claimed in claim 65 wherein the article is a glass container.

10           67. A method of decorating an article, said method comprising the steps of:

- (a) providing the heat-transfer label of claim 26; and
- (b) transferring said transfer portion from said support portion to the article.

15           68. The method as claimed in claim 67 wherein the article is a container made of a material selected from the group consisting of glass, a hard plastic (e.g., polypropylene, polystyrene, styrene acrylonitrile, polyethylene terephthalate and PEN) and metal.

69. The method as claimed in claim 68 wherein the article is a glass container.

20           70. A method of decorating an article, said method comprising the steps of:

- (a) providing the transfer label of claim 38; and
- (b) transferring said transfer portion from said support portion to the article.

25           71. The method as claimed in claim 70 wherein the article is a container made of a material selected from the group consisting of glass, a hard plastic (e.g., polypropylene, polystyrene, styrene acrylonitrile, polyethylene terephthalate and PEN) and metal.

72. The method as claimed in claim 71 wherein the article is a glass container.

73. A method of decorating an article, said method comprising the steps of:

- (a) providing the transfer label of claim 57; and



(b) transferring said transfer portion from said support portion to the article.

74. The method as claimed in claim 73 wherein the article is a container made of a material selected from the group consisting of glass, a hard plastic (e.g., polypropylene, polystyrene, styrene acrylonitrile, polyethylene terephthalate and PEN) and metal.

75. The method as claimed in claim 74 wherein the article is a glass container.

76. A heat-transfer label, said heat-transfer label comprising:

(a) a transfer portion, said transfer portion comprising

(i) an ink design layer, and

(ii) a heat-activatable adhesive layer over said ink design layer;

and

(b) a support portion, said transfer portion being positioned over said support portion for transfer of the transfer portion from the support portion to an article

under conditions of heat and pressure, said support portion comprising

(i) a carrier, and

(ii) a first release coating positioned over said carrier, said first release coating being made of a non-wax, non-silicone, thermoset release material, said first release coating separating cleanly from said transfer portion with no visually discernible portion of said first release coating being transferred to the article along with said transfer portion, said first release coating exhibiting a release value of about 70-350 g/inch when an adhesive film which has been applied thereto is removed therefrom at a 15 degree angle using Scotch 810 tape at a rate of 12 in/min at room temperature.

77. The heat-transfer label as claimed in claim 76 wherein said first release coating exhibits a release value of about 125-200 g/inch when an adhesive film which has been applied thereto is removed therefrom at a 15 degree angle using Scotch 810 tape at a rate of 12 in/min at room temperature.

78. A transfer label, said transfer label comprising:

(a) a transfer portion, said transfer portion comprising

- (i) an ink design layer, and
- (ii) a pressure-sensitive adhesive layer over said ink design layer;

and

(b) a support portion, said transfer portion being positioned over said support portion for transfer of the transfer portion from the support portion to an article under conditions of pressure, said support portion comprising

- (i) a carrier, and
- (ii) a first release coating positioned over said carrier, said first

release coating being made of a non-wax, non-silicone, thermoset release material, said first release coating separating cleanly from said transfer portion with no visually discernible portion of said first release coating being transferred to the article along with said transfer portion, said first release coating exhibiting a release value of about 70-350 g/inch when an adhesive film which has been applied thereto is removed therefrom at a 15 degree angle using Scotch 810 tape at a rate of 12 in/min at room temperature.

79. The transfer label as claimed in claim 78 wherein said first release coating exhibits a release value of about 125-200 g/inch when an adhesive film which has been applied thereto is removed therefrom at a 15 degree angle using Scotch 810 tape at a rate of 12 in/min at room temperature.

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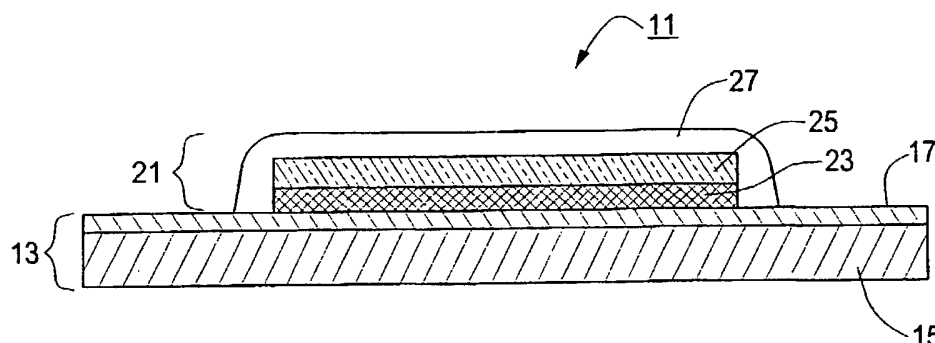
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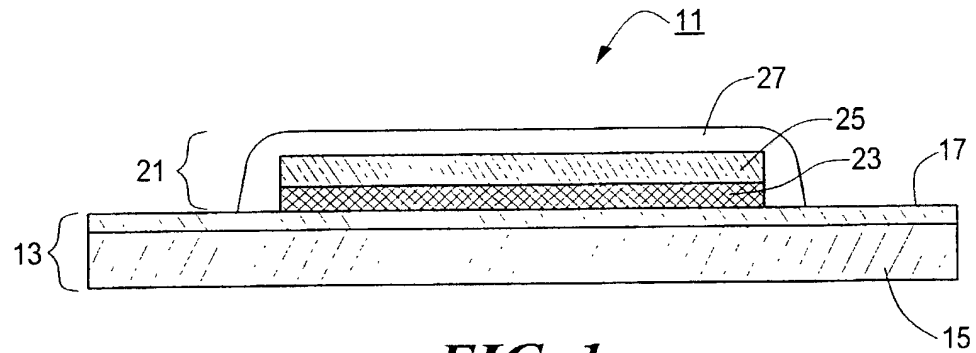


(57) Abstract: A heat-transfer label (11) including a non-wax, non-silicone release layer or coating (17) for use in decorating an article, such as a glass container, without leaving a visually discernible release residue on the decorated article. In a preferred embodiment, the label includes a transfer portion (21), the transfer portion comprising a protective lacquer layer (23), an ink design layer (25) over the protective lacquer layer, and a heat-activatable adhesive layer (27) over the ink design and protective lacquer layers. The label also includes a support portion (13), the transfer portion being positioned over the support portion for transfer of the transfer portion from the support portion to an article under conditions of heat and pressure. The support portion comprising a carrier layer (15) and a release layer or coating.

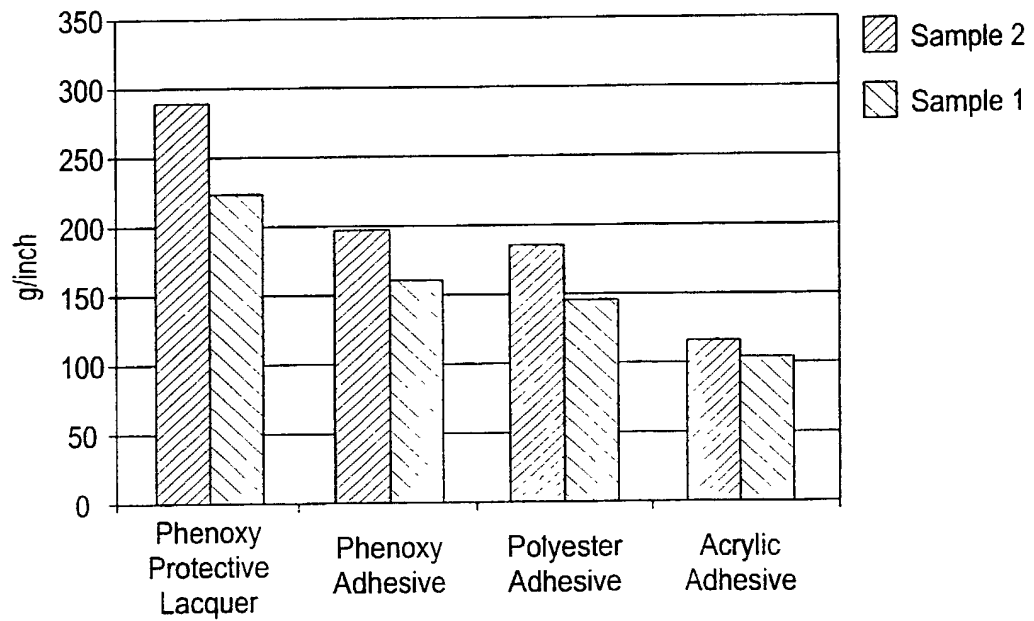


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**FIG. 1**



**FIG. 2**

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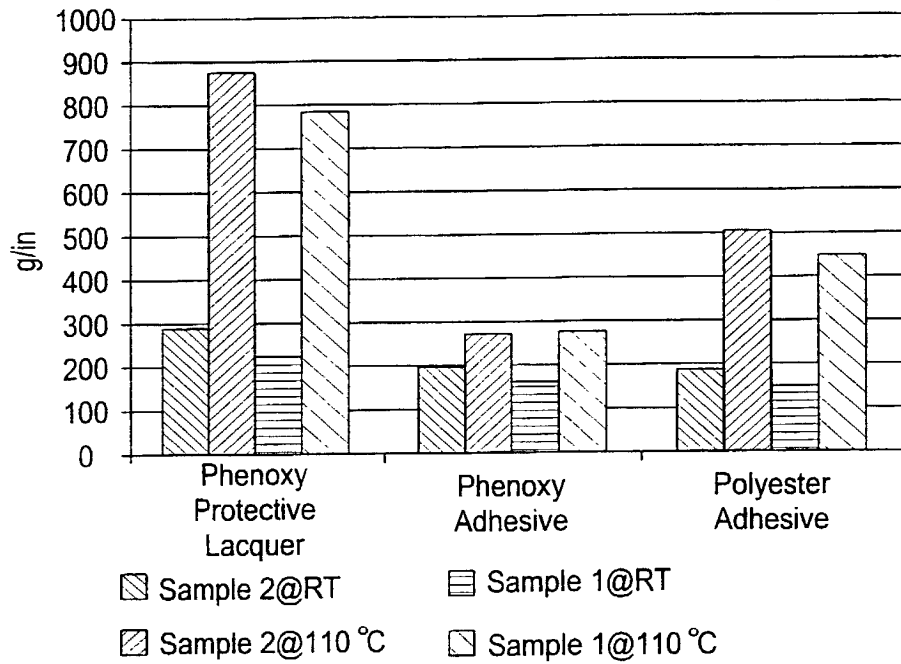


FIG. 3

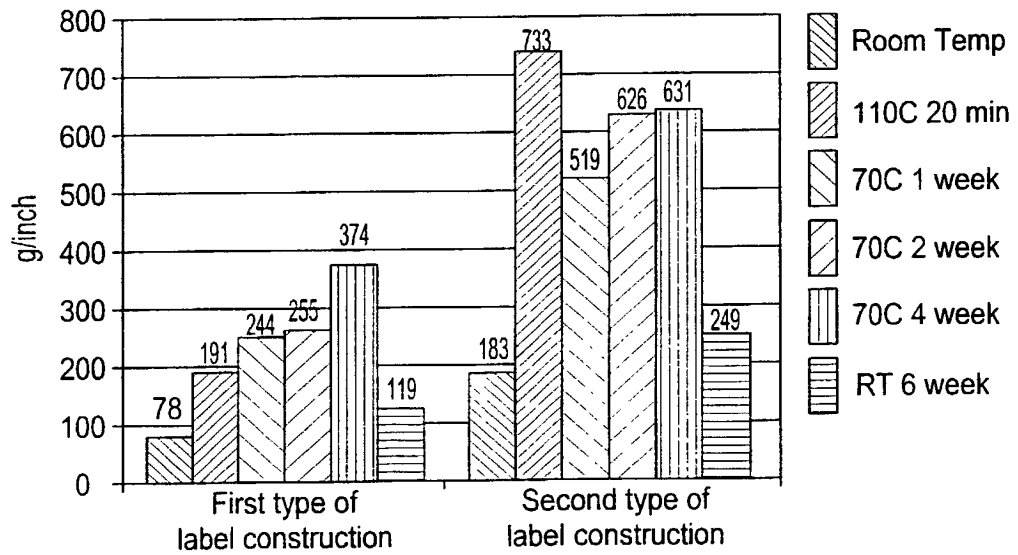
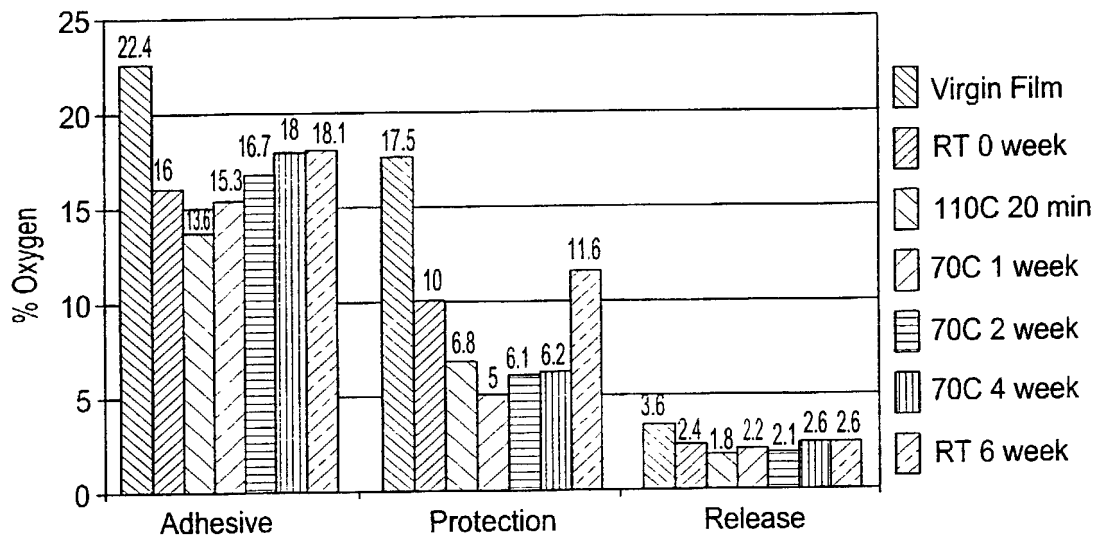


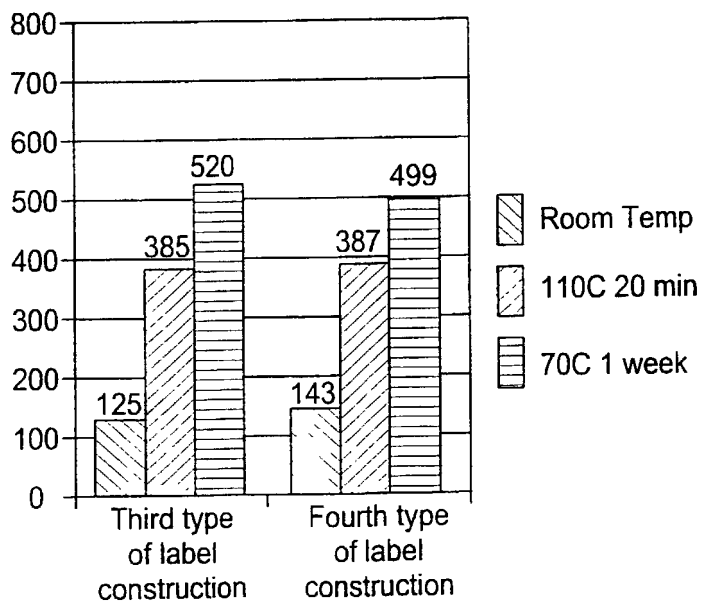
FIG. 4

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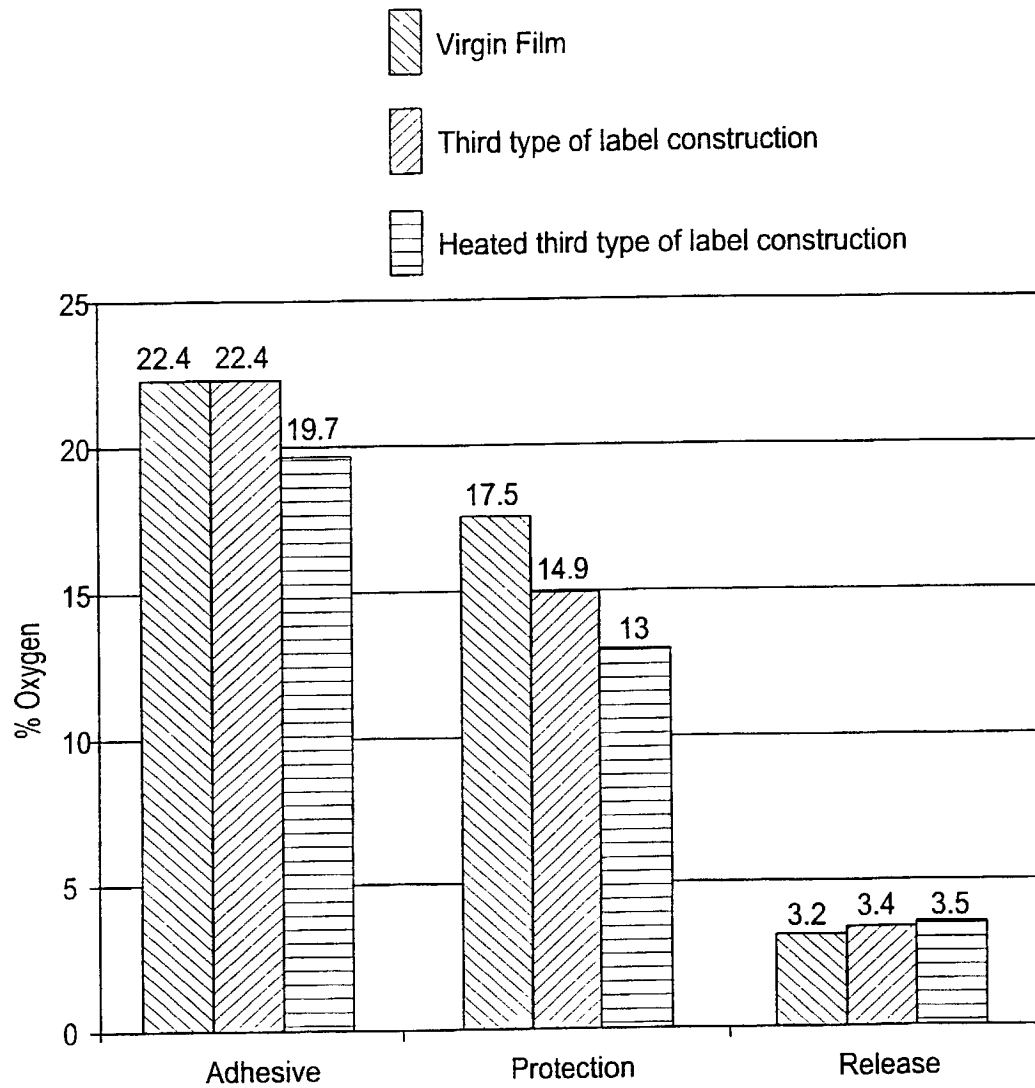


**FIG. 5**

**FIG. 6**



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**FIG. 7**

**DECLARATION FOR PATENT APPLICATION**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled, HEAT-TRANSFER LABEL INCLUDING NON-WAX RELEASE COATING, the specification of which: (check one)

☐ is attached hereto.

☒ was filed as PCT Application No. PCT/US00/17703 on June 28, 2000 and has been assigned U.S. Patent Application Serial No: 10/031,144.

☐ was filed on \_\_\_\_\_;  
and assigned Serial No.: \_\_\_\_\_

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

Priority Claimed

☐ yes ☐ no

\_\_\_\_\_  
(number) (country) (day/month/year filed)

☐ yes ☐ no

\_\_\_\_\_  
(number) (country) (day/month/year filed)

I hereby claim the benefit under Title 35, United States Code, 119(e) of any United States provisional application(s) listed below:

PROVISIONAL APPLICATION NUMBER

FILING DATE:

60/142,728

July 8, 1999



81350PROPCT/US

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations 1.56(a) which became available between the filing date of the prior application and the national or PCT international filing date of this application:

_____ (application number)	_____ (filing date)	_____ (Status - patented, pending, abandoned)
_____ (application number)	_____ (filing date)	_____ (Status - patented, pending, abandoned)
_____ (application number)	_____ (filing date)	_____ (Status - patented, pending, abandoned)
_____ (application number)	_____ (filing date)	_____ (Status - patented, pending, abandoned)

I hereby appoint the following attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

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I hereby declare that all statements made herein of my own knowledge are true and that any statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

81350PROPCT/US

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